Math Readiness of Incoming Students at Normandale Community College

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CENTER FOR
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COLLEGE OF EDUCATION
+ HUMAN DEVELOPMENT
UNIVERSITY OF MINNESOTA

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Introduction

More than 70% of students who enrolled at Normandale Community College in 2009 tested into a remedial level math class. Students are placed in math courses based on their scores on a three-part ACCUPLACER test. This test is taken prior to registering for college courses.

The high percentage of students testing into developmental math is a concern for several reasons. Because students must complete these remedial classes before continuing on with other degree program courses, it prolongs their degree program. In addition to prolonging the time it takes to complete their degree, it is also an additional cost to students as they must pay for these remedial courses like any other program course. Finally, according to Normandale Community College staff, 50% of the teaching being conducted in the math department at the college is currently focused on developmental mathematics. The staff time and resources spent on planning, preparing, and teaching remedial math courses could be redirected to college level courses or electives if the percentage of students needing remedial instruction decreased.

The purpose of this study was to analyze student data to better understand the contributing factors to the high percentage of incoming students testing into remedial level math courses. The students being studied in our sample are those who graduated from Bloomington high schools in the past four years and who subsequently enrolled in Normandale Community College.

Methods

Bloomington School District and Normandale Community College provided the data for the Center for Applied Research and Educational Improvement (CAREI) evaluation team. Data included the ACCUPLACER scores, course grades in high school math, when courses were taken, high school GPA, high school math GPA, MCA II scores and proficiency levels, and course grades in remedial math courses, and demographic data for students who graduated from Thomas Jefferson or John F. Kennedy High Schools in 2006, 2007, 2008, or 2009.

High school math courses with the same content are given a variety of titles. To better manage and analyze high school course data, the courses were collapsed and relabeled by members of the math department in the Bloomington School District into four categories: basic, regular, advanced, and elective courses.

Databases were cleaned and merged matched on student name and birth date.

Findings

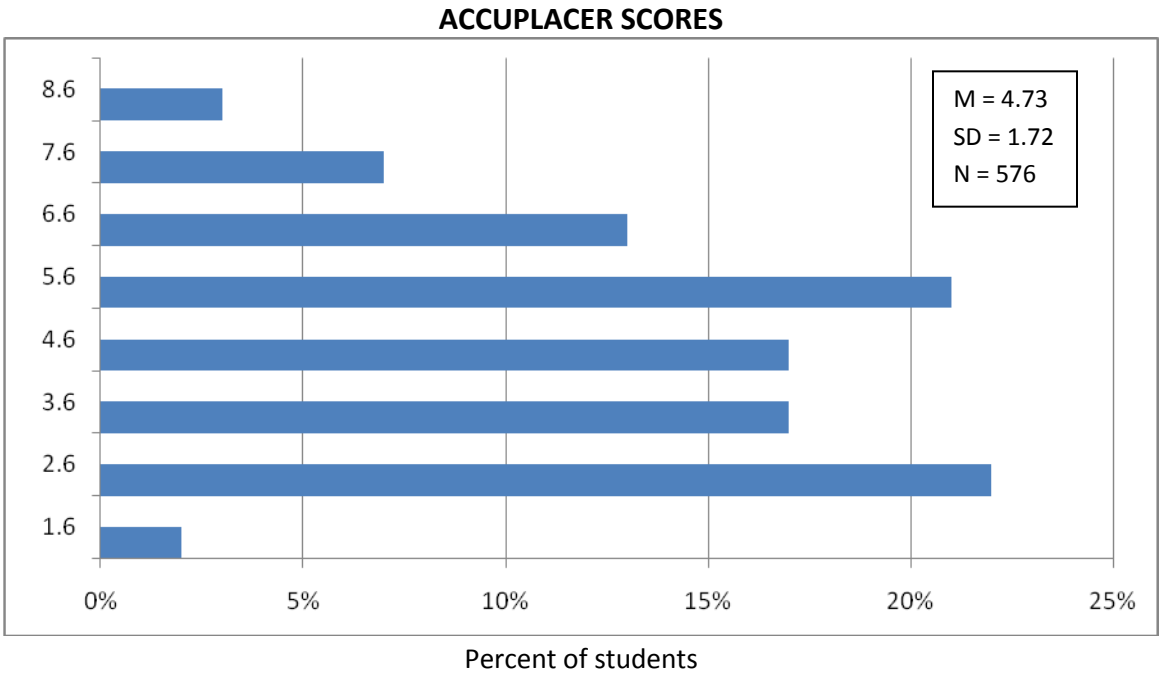
ACCUPLACER

Normandale College uses ACCUPLACER test scores to place students into math courses. Scores on the test range from 1.6 to 8.6. Students who score below 6.0 are placed in developmental math courses. In initial discussions, there were doubts raised about the accuracy of the ACCUPLACER as a placement test. Some stakeholders believed that the problem might be that the placement test was not accurately determining student performance as related to the need for math remediation. We ran product moment correlations to examine the relationship between ACCUPLACER scores and student high school grades as well as math MCA II tests. We found that ACCUPLACER scores were correlated with both high school grades and MCA II proficiency. These four statistically significant correlations (all at a two-tailed $p < 0.001$) can be characterized as "moderate" in size:

- Significant correlation between last high school math course grade and ACCUPLACER score (r=.231)
- Significant correlation between ACCUPLACER score and undergraduate GPA (r=.265)
- Significant correlation between total high school GPA and ACCUPLACER score (r=.336)
- Significant correlation between ACCUPLACER score and math proficiency on MCA II (r=.407)

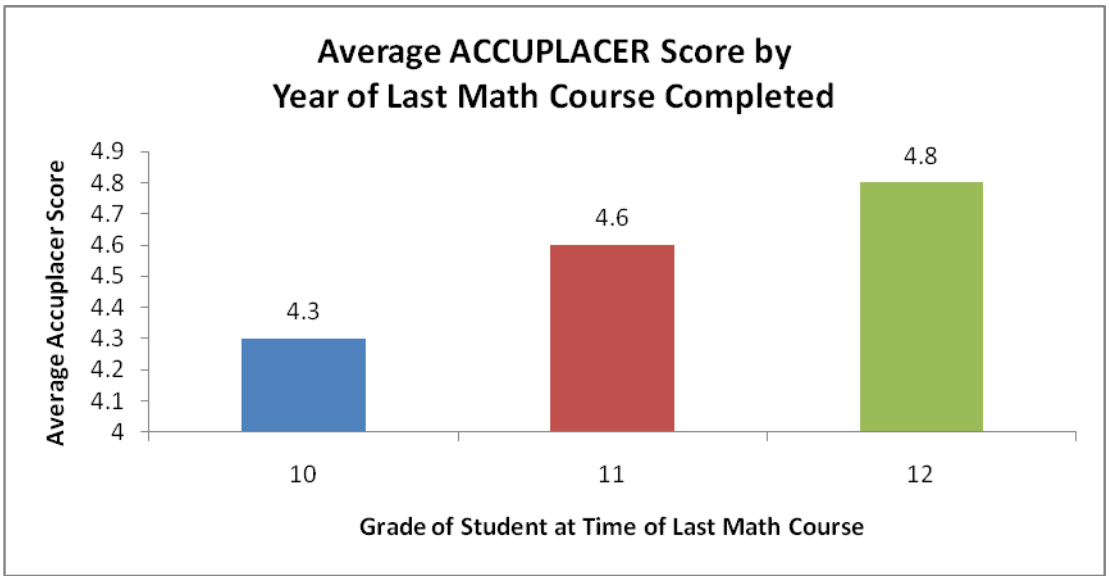
The average ACCUPLACER score for students was 4.73. Students need to score at least 6.0 to enroll in college level courses. While the majority of students scored below 6.0, 21% of students scored just below the cutoff with a score of 5.6. See Figure 1 below.

Figure 1.



On average, ACCUPLACER scores went up slightly for students who took math courses later into their high school career (see Figure 2). While students who took their last math course as sophomores had an average score of 4.3, students who took math in their junior year had an average score of 4.6, and if they took their last math class their senior year their average score was 4.8. Although the average score increased with each year of math, the differences were not statistically significant, and on average, students still scored below the 6.0 cutoff. Twenty-three percent scored above 6.0, and 77% were referred to remedial classes.

Figure 2.

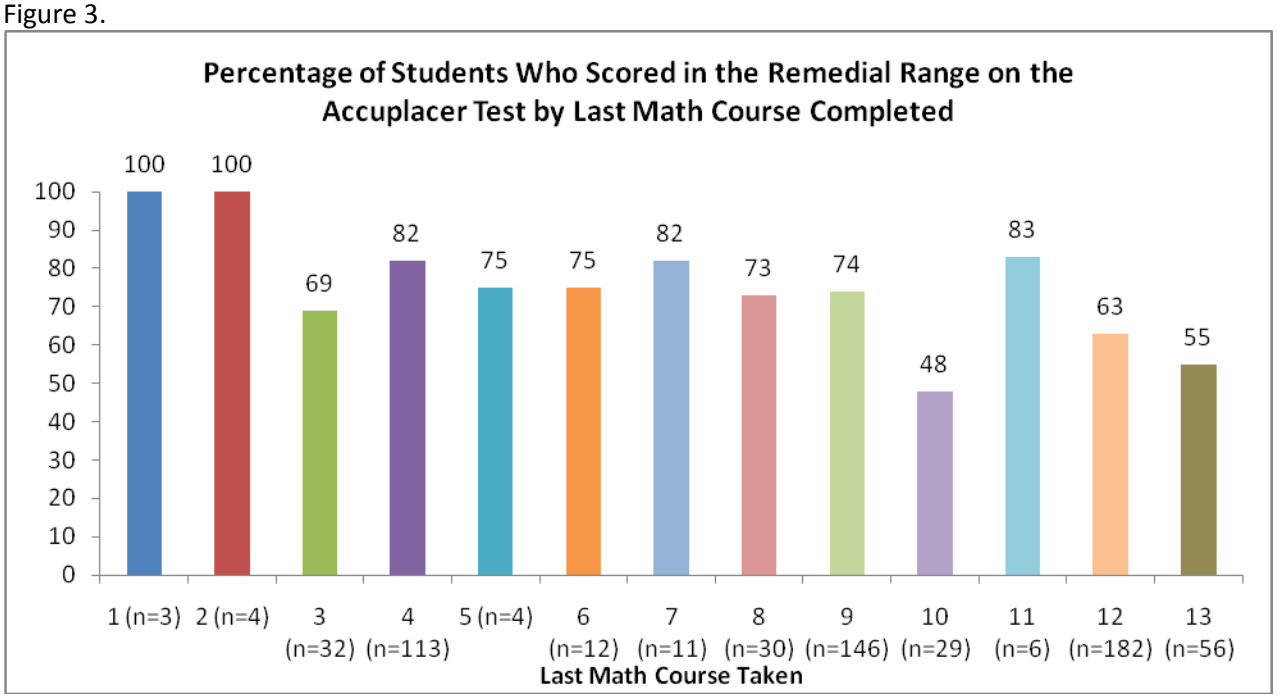


COURSE WORK

We looked at the timing and the type of math coursework that students completed in high school to examine the relationship(s) with placement scores. See Figure 3 below.

The percentage of students who scored in the remedial range of the ACCUPLACER test varied by the type of the last math course completed. For the most part, a smaller percentage of students scored in the remedial range on the ACCUPLACER test if their last math coursework was advanced. For example, students whose last course was an advanced statistics course comprised the smallest percentage scoring in the remedial range. The largest percentages of students who scored in the remedial range had only completed the most basic courses: algebra 1 basic, algebra regular, algebra 2 regular, geometry regular, and elective basic.

Figure 3.

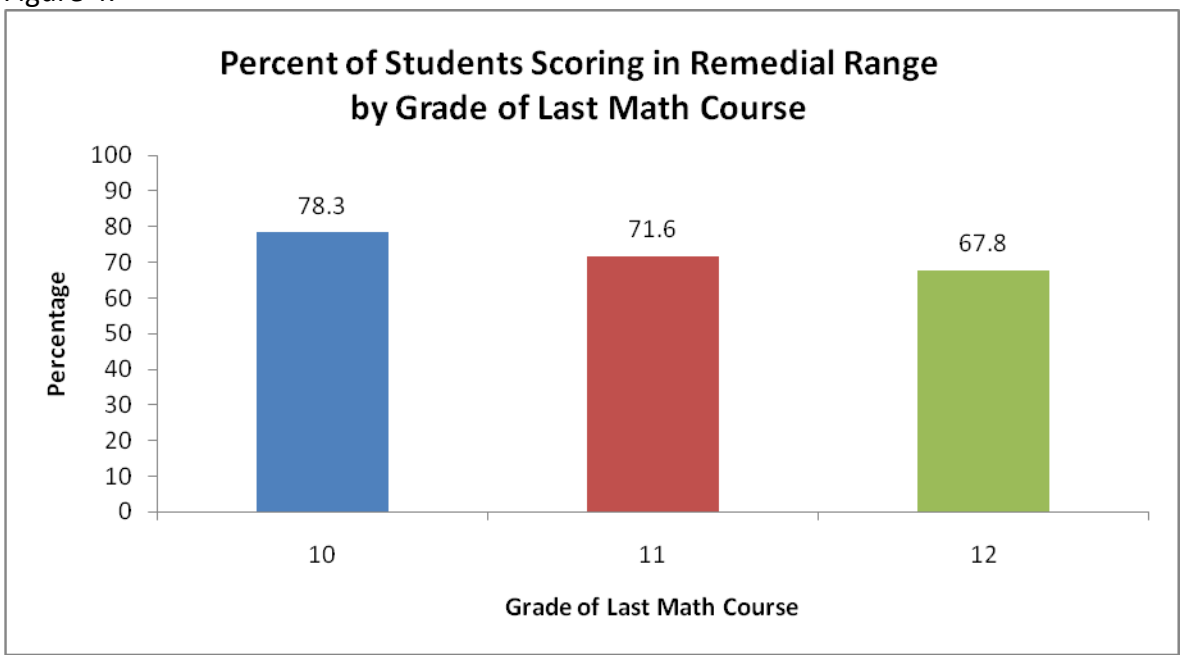


Key:

1. Algebra 1 Basic
2. Algebra 1 Regular
3. Algebra 2 Basic
4. Algebra 2 Regular
5. Algebra 2 Advanced
6. Geometry Basic
7. Geometry Regular
8. Statistics Basic
9. Statistics Regular
10. Statistics Advanced
11. Elective Basic (e.g. Basic Math Skills, Math Skill Development)
12. Elective Regular (e.g. Computer Programming, Calculus I, Precalculus II)
13. Elective Advanced (e.g. AP Calculus AB, Calculus BC, Honors Pre-Calc)

In terms of when students took their last math class in high school, we found a downward trend in the percentage of students in the remedial range across the grade of last math course (see Figure 4). There were more students in the remedial range when they last completed a course in 10th grade. It is worth noting, however, that even students who took their last math course in 12th grade were still more likely to test into remedial math than college-level math.

Figure 4.



GPA

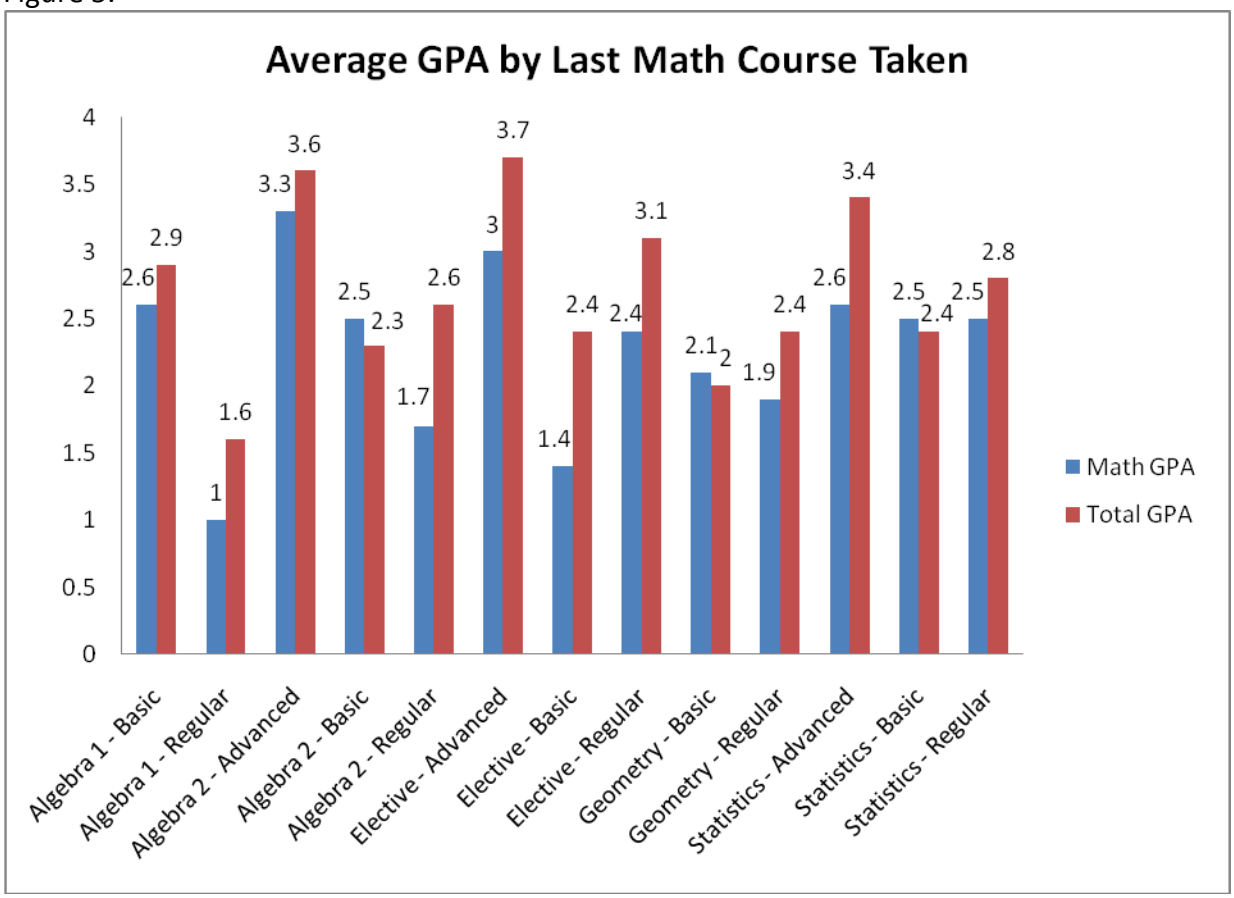
We compared students' undergraduate GPA to their last math course grade, as well as to their high school GPA and math GPA, and found:

- Moderate correlation between last math course grade and undergraduate GPA (r = .244)
- Very strong correlation between Total GPA and Math GPA (r = .853)

The *p* values of these two statistically significant correlations were less than 0.001 (two-tailed).

Students who had an advanced math class as their last math course, on average, had a higher GPA than students in basic level courses. The highest average GPAs were reported for students whose last math courses were an advanced elective, advanced algebra 2, or advanced statistics. These results support the finding that students who completed these courses as their last high school math courses were least likely to score in the remedial range of the ACCUPLACER.

Figure 5.



Summary and Conclusions

We found statistically significant correlations between high school performance and MCA II test results, as well as with ACCUPLACER scores. The average ACCUPLACER score for incoming freshmen was 4.73, well below the 6.0 cutoff for remedial math courses at Normandale Community College. While it is true that students who took math courses into their senior year had higher average scores, their scores still placed them in the remedial math range.

Not surprisingly, the last course taken and the year it was taken are important factors. Students who took math courses as late 12th grade were less likely to score in the remedial range than students who took their last math course in 10th grade, and students whose last math course was an advanced level course were less likely to score in the remedial range on the ACCUPLACER.

One suggestion we offer would be for differentiated remediation. Currently the only option for incoming students who test at the remedial level for mathematics is to take a remedial math course at Normandale Community College prior to taking other math courses. We would suggest providing alternative options to get students ready for college level math. For example, the college could offer an abbreviated refresher or bridge course in the summer. Another option would be for high schools to offer a refresher math course to seniors prior to taking the ACCUPLACER. This might be enough for students to increase their scores and begin on track in their program courses.

Thoughts for Future Related Investigations

- Is Normandale's placement into remedial math classes similar to that of other area community and technical colleges?
- Further investigation of course-taking by seniors in high school, by disaggregating the data to examine their individual course choices and outcomes, may provide some information about why many still tested into remedial math. Inclusion of a different high school that feeds into a different community college would help such an investigation by increasing that sample size in order to look for trends.
- Is the use of 6.0 as the cut score for ACCUPLACER the best choice for placement in remedial classes? How did the students who just missed or just passed the 6.0 mark fare in other classes? Does the placement in remedial math have predictive value for other academic performance outcomes?
- What do we know about the students who didn't test in the remedial range? What factors may have accounted for their success?